

WHAT IS CLAIMED IS:

1. An etching method comprising:

preparing a photoresist pattern;

treating the photoresist pattern with plasma that provides carbon radicals;

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selectively etching an etching target layer by using the plasma-treated

photoresist pattern as an etch mask.

2. The method of claim 1, further comprising generating the plasma by

10 exciting carbon monoxide.

3. The method of claim 1, further comprising generating the plasma by

exciting carbon dioxide.

4. The method of claim 1, wherein the etching target layer is formed

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of a material layer selected from a group consisting of a silicon oxide layer, a

silicon nitride layer, a silicon oxynitride layer, and an organic anti-reflective

coating layer.

5. The method of claim 1, wherein the etching of the etching target

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layer is performed using plasma containing fluorine radicals.

6. The method of claim 1, wherein the etching of the etching target layer is performed using plasma generated by exciting a fluorocarbon gas.

7. The method of claim 1, wherein the etching of the etching target layer is performed in a same reaction chamber as the plasma treatment without breaking vacuum.

8. The method of claim 7, wherein the etching of the etching target layer is performed by applying an RF bias power to a rear surface of the etching target layer,

and the plasma treatment is performed by applying no RF bias power or applying a lower RF bias power than the RF bias power applied during the etching of the etching target layer.

9. An etching method comprising:
preparing a photoresist pattern;
treating the photoresist pattern with plasma generated by exciting a fluorine-free carbon-containing gas; and
selectively etching an etching target layer by using the plasma-treated photoresist pattern as an etch mask.

10. The method of claim 9, further comprising generating the plasma by exciting carbon monoxide.

11. The method of claim 9, further comprising generating the plasma by
5 exciting carbon dioxide.

12. An etching method comprising:
preparing a photoresist pattern;
forming a polymer layer comprising carbon on the surface of the
10 photoresist pattern using plasma generated by exciting a fluorine-free
carbon-containing gas; and
selectively etching an etching target layer using as an etch mask the
photoresist pattern on which the polymer layer is formed.

13. The method of claim 12, wherein the plasma is generated by
15 exciting carbon monoxide.

14. The method of claim 12, wherein the plasma is generated by
exciting carbon dioxide.

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15. An etching method comprising:

preparing a photoresist pattern by optical lithography using an ArF light

source;

treating the photoresist pattern with plasma generated by exciting a

5 fluorine-free carbon-containing gas;

selectively etching an etching target layer by using the plasma-treated
photoresist pattern as an etch mask; and

removing the remaining photoresist pattern by ashing.

10 16. The method of claim 15, wherein the plasma is generated by
exciting carbon monoxide.

17. The method of claim 15, wherein the etching target layer is formed
of a material layer selected from a group consisting of a silicon oxide layer, a
15 silicon nitride layer, a silicon oxynitride layer, and an organic anti-reflective
coating layer.

18. The method of claim 15, wherein the etching of the etching target
layer is performed using plasma generated by exciting a fluorocarbon gas.

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19. The method of claim 15, wherein the etching of the etching target layer is performed in a same reaction chamber as the plasma treatment without breaking vacuum.

5 20. The method of claim 19, wherein the etching of the etching target layer is performed by applying an RF bias power to a rear surface of the etching target layer,

and the plasma treatment is performed by applying no RF bias power or applying a lower RF bias power than the RF bias power applied during the
10 etching of the etching target layer.

21. An etching method comprising:
preparing a photoresist pattern;
forming a polymer layer comprising carbon on the surface of the
15 photoresist pattern; and
selectively etching an etching target layer by using the photoresist pattern on which the polymer layer is formed as an etch mask.

22. The method of claim 21, wherein the polymer layer is formed using
20 plasma generated by exciting a fluorine-free carbon-containing gas.

23. The method of claim 22, further comprising generating the plasma by exciting carbon monoxide.

24. The method of claim 22, further comprising generating the plasma
5 by exciting carbon dioxide.

25. The method of claim 21, wherein the etching of the etching target layer is performed using plasma generated by exciting a fluorocarbon gas.